

New Records of *Polymita venusta* (Gmelin, 1792) Populations in Northern Foothills of Sierra de Boniato, Santiago de Cuba Province

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ABSTRACT Three new localities of *Polymita venusta* are uncovered from the northern foothills of Sierra de Boniato in the Santiago de Cuba province. In those, five new populations inhabiting fragmented forests over karstic substratum were found between 238-405 meters above sea level. The rediscovery of a unique color form took place in one colony from the La Luz vicinity. These populations occupy a highly deforested area where the main activities are cattle grazing and agriculture, combined with other anthropic threats. Protected Areas planning for this human highly disturbed zone is nonexistent.

KEYWORDS Cuban land snails, Cepolidae, *Polymita*, *Polymita venusta*, tree snails, Sierra Maestra, Seirra de Boniato

INTRODUCTION

Polymita venusta (Gmelin, 1786) (Cepolidae), is an endemic and endangered Cuban land snail recognized by its beautiful shell and high chromatic polymorphism. It is the most widespread of all the species in the genus, and seemingly survives in no more than 20 karstic vicinities throughout Santiago de Cuba province. The main confirmed habitat regions in this province are the karstic areas of La Mella's Quarry (Mella municipality, south foothills of Altiplanicie de Nipe), Baire-La Tabla-Los Negros-Maffo (NW Tercer Frente municipality, northern foothills of Sierra del Turquino) and the coastal marine terraces southeast of Santiago de Cuba municipality (Meseta Cársica de Santiago de Cuba) (Maceira, 2000; Maceira *et al.*, 2009), this latter region is covered largely by xerophytic shrub and microphyll semideciduous forest. However, there are no records of this species in the scientific literature from other mountain regions such as Sierra de La Gran Piedra, Sierra de Boniato, and Cauto

river plains basin, with exception of the isolated population found in Monte Barranca forest (Palma Soriano municipality) (reported by Cardona *et al.*, 2009 and Méndez-Hernández, 2009).

Few of those areas contain large populations with high densities. Yet, the majority of the recorded populations of *P. venusta* in that eastern province of Cuba are small low density colonies scattered in patches. However, records from old collections echo how dense those populations once were. Even though, it is difficult to grasp the magnitude of habitat loss and forest fragmentation that these tree snails witnessed since the 18th century, today this species is in the Santiago de Cuba province extent. As commonly happens, recorded localities of any land snails are associated with the interest in publishing those findings by the collectors. If they are not published, and location information can only be found on Museum labels or in research theses that are never published, it becomes difficult to confirm

the extant and endangered populations, decreasing all possible conservation efforts.

Described formerly by J. F. Gmelin in 1792 (but illustrated before in 1786) this species type locality was in fact reported by C. de la Torre in his 1950 posthumous monograph of the genus (Torre, 1950, p.14). Torre, had named this species, in his earlier manuscript accounts, *Helix picta rubrolimbata* and *Helix picta rubrocincta*, and placed *P. venusta* at “Provincia de Oriente, menos los términos de Baracoa y Sagua de Tánamo” (Eastern province, except the Baracoa and Sagua de Tanamo vicinities). Hence, the first locality mentioned of *P. venusta* by Torre from Santiago de Cuba was Aguadores, the place where he considered the *typical form* to inhabit. Other localities from this province were mentioned and can be found on specimen labels from between 1912 and 1952 (e.g. Carretera Central, Finca de Borrero, cerca de Charco Mono, Finca Santa María, El Cobre, Finca La Rosita de los hermanos Borrero, Barrio de Río Frío, Lagunas cerca de Aguadores, Jarahueca, Central Miranda, Cayo del Rey, Siboney, etc.). Years after, from 1987 to 2017, more localities and populations of *P. venusta* from this province were recorded and reported (e.g. Sardinero, Monte Barranca, La Tabla, etc.).

In this paper we discuss only the new records and color varieties of *P. venusta* from San Luis municipality, specifically those located in Sierra the Boniato, an area belonging to Sierra Maestra mountain range, located north of the Tectonic Basin of Santiago de Cuba (Núñez & Viña, 1976). The only new recorded population we could not reach to study was north of Magueyal de San Luis.

MATERIALS AND METHODS

The five *P. venusta* populations were found during field trips conducted from June to September of 2018, in three new localities, all from the Sierra de Boniato north side, southern boundaries of the Cauto high plains, San Luis municipality, Santiago de Cuba province (see Figure 1).

All the collected specimens were placed in the malacology collection of the Zoology Department at Centro Oriental de Ecosistemas y Biodiversidad (BIOECO) in Santiago de Cuba city. Other specimens collected in a subsequent field trip (i.e., July, 2019) were bestowed to the Universidad de Oriente Malacology group for lab research. This group belongs to the Biology-Geography Department, also located in Santiago de Cuba city.

We use Reyes (2011-2012) criteria to designate vegetation types, and the host plants names were updated from Greuter & Rankin (2016).

DISCUSSION

New documented populations description

El Tablón-La Estrella [N20°07'35,2099"/W75°51'28,0199"] [405 meters above sea level (masl)]. This population is 2 km south of the town of El Tablón, on the road to the town of La Estrella, in an area probably less than 0.01 km² of extent. As in the other two locations, the specimens were found in a semideciduous mesophyll forest ecotope, specifically in the secondary vegetation; predominantly *Vachellia macranchanta* (Humb. & Bonpl. ex Willd.) Seigler & Ebinger (Fabaceae). The main host-plants were *Erithalis fruticosa* L. (Rubiaceae), *Chrysophyllum cainito* L. (Sapotaceae), *Thouinia trifoliata* Poit. (Sapotaceae), and *Comocladia platyphylla* A. Rich. ex Griseb

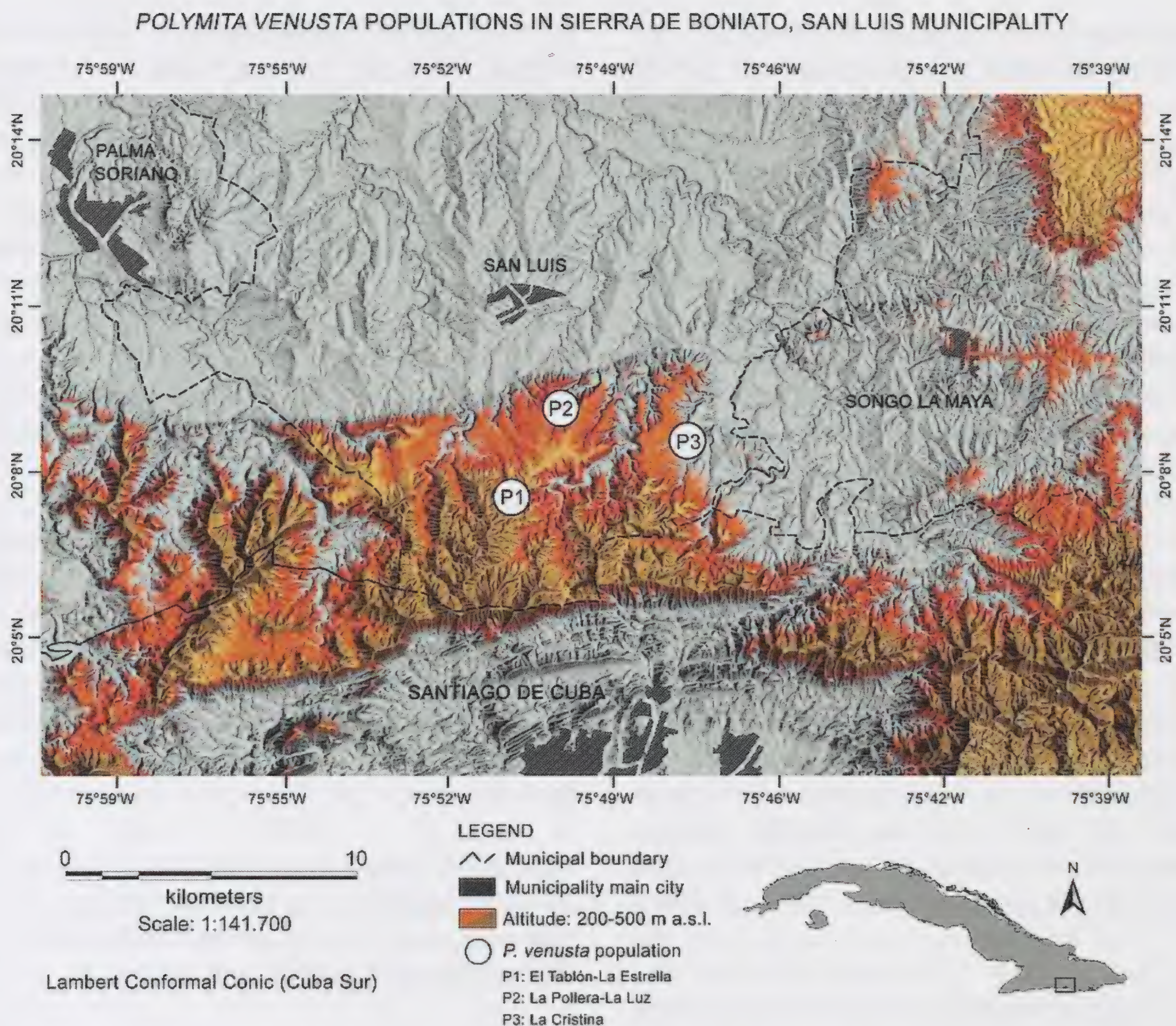


Figure 1. New records of *Polymita venusta* populations in Sierra de Boniato, San Luis municipality.

(Anacardiaceae). Color variations found in this locality include: light yellow with whitish-yellowish sutural and lip band, sometimes with faint banding and specks; typical with specimens sometimes having the bright red sub-sutural and lip band observed in the premature *P. venusta sanguinolenta* (bloody) color form (Torre mss.) (see Figure 2).

La Pollera in La Luz [N20°09'12,2529"/W75°50'33,1125"] [312 masl]. This locality is near the town of La Luz and 2.3 km northeast of El Tablón. This is a small population found in

0.04 km² of extent, 3.1 km N-NE of the El Tablón-La Estrella population and 3.4 km N-NW of the La Cristina population. The area is an abandoned chicken farm (*pollera*) mostly covered by *V. macrachanta*, *Dichrostachys cinerea* (L.) Wight & Arn. (Mimosaceae), *Bursera simaruba* (L.) Sarg. (Burseraceae) and some vines (*Smilax* sp.), which are apparently the main resting substratum for *P. venusta* in this locality. *P. venusta* shares habitat in this locality with other tree snails of the same family, *Coryda alauda* (Férussac, 1821) and *Hemitrochus cesticulus* (Gundlach in Pfeiffer,

1858). Color variations found in this locality are similar to the two morphs found in the El Tablón-La Estrella locality. A third morph, similar to the other two but with a dark sub-sutural band, appeared in this location, rarely with a dorsal thin brownish line. This color variety was indistinctively baptized in manuscript letters by Torre as *nigrosuturalis* or *fuscusuturalis* (from C. de la Torre letters to C. T. Ramsden 1911-1915, deposited at Museum of Natural History C. T. Ramsden at Santiago de Cuba University; also J. F. Milera in 1987 mentions this name but not as *nova ssp.*) (see Figure 3).

Remarks: *P. venusta* color form *nigrosuturalis* or *fuscusuturalis* only occurred in Santiago de Cuba province in a small span from Sierra del Cobre to Sierra de Boniato. In the early-mid 20th century, the area of Sierra del Cobre was subject to *Polymita* over-collecting and today there is no record of any surviving colonies (at least in the last 40 years or so, R. Teruel, personal communication). This likely means that the last population containing this color form is in La Luz!

La Cristina [N20°08'28,7160"/W75°48'44,2378"] [238 masl]. This population is located in a 1.5 km² radius, near to the town of La Cristina about 5 km northeast of the El Tablón-La Estrella population. Three apparently isolated populations were identified, all of them dispersed due the high anthropogenic fragmentation, which includes an active chicken farm to the south, and a slab mining area approximately 1 km to the east (Trinidad's quarry). Specimens were found on shrubs and vines, such as *Ipomoea violacea* L. (Convolvulaceae), but in some places there was a noticeable preference for the non-native *Euphorbia lactea* Haw. (Euphorbiaceae). This preference seems to be recurrent in this species (Santos-Chacón, 2000). Color variations found

in this locality include: light yellow with whitish-yellowish sutural and lip band, sometimes with faint banding and specks; typical bright yellow with sub-sutural and lip bright red band (see Figure 4).

All the reported populations were found in human disturbed areas. Considerable forest loss and nearby human built barriers, such as massive construction sites and wide roads used by trucks for wood extraction or public transport, contributes to lethal dust contamination of *P. venusta* hosts plants (see Figure 5).

Depending on age, habitat features and forest fragmentation, *P. venusta* specimens can range in length from 11-12 mm to 26-28 mm, but average length can be considered to be between 17-22 mm (González-Guillén, A. 2014; González-Guillén, A., in prep.). In the newly recorded localities, the sizes are small, 20 mm, more or less.

Populations with a high diversity of color forms are not frequent in Santiago de Cuba province. The exceptions today are Monte Barranca and Cantera de Mella (Mella's Quarry).

The predominant color in all the newly recorded populations is light to bright yellow. Other new recorded populations in the province seem to follow the same trend. Southern Santiago de Cuba *P. venusta* populations have greenish, gray-bluish, chestnut-red-brownish and yellow banded specimens in low numbers. However, why yellow is the most common key color in *P. venusta* in south-central Santiago de Cuba province is still unknown and cannot be answered by mere abiotic factors (Berovides, *et al.* 1987; Milera, *et al.* 1994). Why the yellow form with a subsutural darker band only exists in a small geographic range between El Cobre and San Luis remains a mystery.

The green and chestnut-red appear together with the yellow color forms most frequently in the northern Santiago de Cuba populations. The other albino, pale colored (*i.e.*, pink, light purplish, light yellow-green, gray-bluish), banded (*i.e.*, *testudinea* and its distinctions) or darker varieties (*i.e.*, very dark *rubiginosa*), are present mostly in the 2 well-known northern populations previously mentioned.

Today, *P. venusta* color forms in the remaining populations display just one or several color variations. This led us to consider that, in the distant past when the species was expanding its domain over eastern Cuba, the morph-chromatism among those earlier populations was likely more diverse than today. The three described varieties of *P. venusta* (*olivacea*, *rubiginosa*, and *testudinea*) and even the manuscript undescribed ones (*testudinaria*, *fasciata*, *albida*, *albina*, *sanguinolenta*, *ferruginosa*, *fuscosuturalis*, *nigrosuturalis*, and *violacea*) (González-Guillén, A., in prep.) do not seem to have unique geographic ranges and often more than one color form can be found on the same plant. Thus, we assume these are merely color forms and not subspecies of *P. venusta*.

Polymita venusta uses a large variety of host plants and is probably the best studied in the last 20 years (Reyes-Tur & González-Rodríguez, 2003; Reyes-Tur, 2004; González-Guillén, A. 2014; Reyes-Tur, *et al.* 2020). The colonies of the three recorded populations mentioned in this paper were connected at one time when the forests covered this area and they likely shared the same plant preferences. But, in La Cristina and La Pollera-La Luz, which are the most damaged from forest loss, these population have learned how to survive using non-native plants. We suspect that the longer and shorter spines of *D. cinerea* and *E. lacteal*, as well as its toxic fluids, have provided some protection for the

tree snails against certain predators. Further, the lichens that appear on the trunks of *D. cinerea* could also be a food source.

Only five Protected Areas in Santiago de Cuba contain *P. venusta* populations in its terrestrial bounds: the Managed Floristic Reserve *Monte de Barranca* (311,4 ha); the Managed Protected Area *Carso de Baire* with 7 613,6 ha; and the Protected Area of Managed Resources *Reserva de la Biosfera Baconao* (66 390 ha in Santiago province), which includes the Ecological Reserve *Siboney-Jutisí* (905,00 ha) and the Protected Natural Landscape *Estrella-Aguadores* (210,30 ha) (CNAP, 2013). However, the bulk of the known surviving populations of this species, are not inside any Protected Area. This is the case with the new populations found in the San Luis municipality. Those colonies are threatened and endangered mainly for anthropic, agriculture, mining, cattle grazing and primary cover forest loss reasons. Its survival in these regions depends on future local government action to preserve this beautiful endemic species. Additional studies are required to clarify those and other ecological aspects, such as behavior and adaptations traits of *P. venusta* in disturbed areas, as a way to promote local conservation efforts and to improve management strategies.

A thoughtful evolutionary response study of *Polymita* tree snails' polymorphism could provide some of the most precise indicators of climate alteration. Its short life-span and disproportionate collecting records since the late 19th century offer an exceptional opportunity to measure color phenotype frequencies, habitat change and thermal reactions. Sadly, such an investigation would require incalculable funds and years to review all the most important museum collections in the United States, Europe and Cuba. But, it is possible to protect all the existing populations, making available its remaining genetic pool for future research.

CONCLUSIONS

In our field trips we found some unrecorded *P. venusta* populations from Sierra de Boniato in the San Luis municipality foothills, which are part of Sierra Maestra mountain range. It was also remarkable to observe how those colonies have endured in places under harsh anthropic pressures, sometimes benefiting from non-native plants.

ADDITIONAL REMARKS

Regrettably, some malacological investigations conducted during the past two decades in eastern Cuba, were embedded with unfortunate assumptions, related with the extinction of *P. venusta* in the areas of Aguadores, Sardinero and Siboney (Santiago de Cuba province eastern plateau), which is not true. Tree snails such as *Polymita* and *Liguus* tend to live as a colony in patches throughout different ecosystems. This behavior was already noticed by J. B. Henderson in 1912, who wrote "...these creatures have a gregarious habit and live in colonies". Even in circumstances with optimal forest and host plants, you can find one or more colonies limited to very small areas consistently for several years. Tree snails are not motionless animals that only stop moving when they reach the forest fringe. We now know that they can travel through the litter and dirt in the rainy season, reaching and colonizing other nearby forest patches.

Thus, these hasty assumptions and conclusions tend to diminish any management actions and conservation strategies to protect this endangered land snail. In a forthcoming paper, we discuss new records of *P. venusta* populations in the Santiago de Cuba province plateau, and some fresh viewpoints on its actual distribution, threats and conservation challenges in this area.

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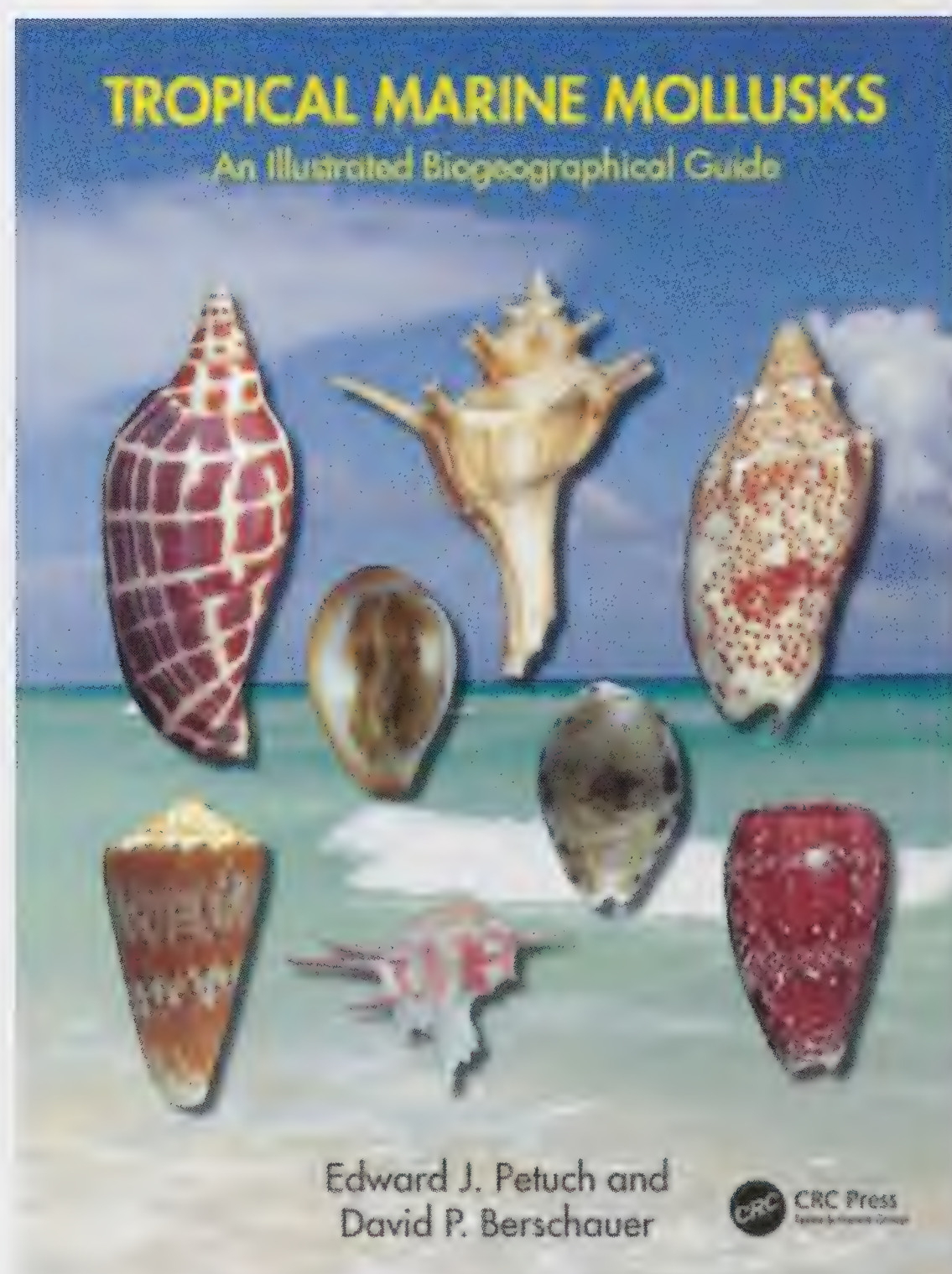
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Figure 2. *Polymita venusta* morphs and host plants from El Tablón-La Estrella. *Erithalis fruticosa* (middle left), *Chrysophyllum cainito* (middle right) and *Comocladia platyphylla* (bottom left).



Figure 3. *Polymita venusta* morphs and host-plants from La Pollera-La Luz. Three morphs on *Bursera simaruba* (middle left) and light-yellow white banded form on *Smilax* sp. (upper right). Color variation named as *nigrosuturalis* was found only in this locality (upper, middle and bottom left pictures).



Figure 4. *Polymita venusta* morphs and host plants from La Cristina locality. Light-yellow morphs on *Vachelia macracantha* (upper left) *Euphorbia lactea* (middle left), and *Ipomoea violacea* (bottom).



Figure 5. *Polymita venusta* habitats in Sierra de Boniato. 1-2= La Cristina localities. 3-4= El Tablón-La Estrella locality, specimens were found both sides of the road. 5-7= La Pollera-La Luz locality.